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Genetic engineering of groundnut for crop improvement: Current status and future prospects

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Peanut or groundnut (*Arachis hypogaea* L.) is a key commodity in the livelihoods of the rural poor in the semi-arid tropics. Several biotic and abiotic stresses, lack of high yielding adapted cultivars and aflatoxins adversely affect its productivity, quality and international trade. Inadequate resistance in the available germplasm for several constraints necessitates the use of modern biotechnological approaches such as transgenic technology which provides an attractive alternative to the development of enhanced germplasm. At ICRISAT, extensive efforts have been made to develop tissue culture and *Agrobacterium tumefaciens*-mediated genetic transformation protocol for groundnut by using the cotyledon explants from mature seeds. This protocol is highly efficient and available for routine applications including the development of marker-free transformants for the recovery of clean transgenic events at high transformation frequencies (50-70%). ICRISAT has developed a pipeline of genetically engineered groundnuts for several traits that are in different stages of product development. These include pathogen-derived resistance to viruses like the *Indian peanut clump virus* and *Tobacco streak virus*, anti-fungal genes for resistance to fungal pathogens and aflatoxin contamination, tolerance to drought stresses and nutritional enhancement by the over-production of ß-carotenes. The promising events will be either directly used in future breeding programs or gene pyramiding with other genes of interest. Besides, newer approaches such as antisense and RNAi technologies are being developed for groundnut crop improvement. Details of the transformation activities and current status of the groundnut transgenics developed at ICRISAT to address these issues will be discussed.